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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ZVI YANIV

Appeal 2009-001779
Application 10/633,335
Technology Center 1700

Decided:¹ June 30, 2009

Before TERRY J. OWENS, BEVERLY A. FRANKLIN, and
MARK NAGUMO, *Administrative Patent Judges*.

FRANKLIN, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

¹ The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, begins to run from the Decided Date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

Appellant seeks review under 35 U.S.C. § 134 of the final rejection of claims 1-15 and 21-30. We have jurisdiction under 35 U.S.C. § 6(b) (2002).

Claim 1 is representative of the subject matter on appeal and is set forth below:

1. A process comprising:
 - a) exposing a chemical species to nanoparticles such that said chemical species physisorbs onto a surface of the nanoparticles as an adsorbate, wherein such exposing is carried out as an exposure selected from the group consisting of a gas phase exposure, a solid phase exposure, and combinations thereof;
 - b) irradiating the nanoparticles comprising the adsorbate with radiation;
 - c) detecting altered photoluminescence properties of the nanoparticles comprising the adsorbate as a result of the chemical species being physisorbed onto the surface of the nanoparticles; and
 - d) analyzing the altered photoluminescence properties by comparing to one or more pre-defined altered photoluminescence properties, to provide for an identifying of the chemical species.

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Ouellet	5,457,073	Oct. 10, 1995
Weiss	5,990,479	Nov. 23, 1999
Barbera-Guillem	6,261,779 B1	Jul. 17, 2001
Daniels	2002/0004246 A1	Jan. 10, 2002
Vossmeye	6,458,327 B1	Oct. 01, 2002

Dimitrov	2003/0013091 A1	Jan. 16, 2003
West	6,530,944 B2	Mar. 11, 2003
Chee	6,544,732 B1	Apr. 08, 2003
Harris	2004/0009911 A1	Jan. 15, 2004
Hubby, Jr.	6,778,165 B2	Aug. 17, 2004
Ravkin	6,908,737 B2	Jun. 21, 2005

SUMMARY OF THE DECISION

We reverse.

THE REJECTIONS

1. Claims 1, 3, 5, 8, and 15 are rejected under 35 U.S.C. § 102(e) as being anticipated by Dimitrov.
2. Claims 1-5, 8, 10, 11, 14, 21, 22, 25, 26, and 30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Weiss in view of Dimitrov or Vossmeye.
3. Claims 1-5, 8, 12, 15, 21, 22, 27, 29, and 30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Daniels in view of Dimitrov or Vossmeye.
4. Claims 1-3, 5, 6, 8, 10, 11, and 14 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Chee in view of Dimitrov or Vossmeye.
5. Claims 1-3, 5, 6, 8, 10, 11, and 14 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Barbera-Guillem in view of Dimitrov or Vossmeye.
6. Claims 2, 21, 25, 26, and 29 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Dimitrov in view of Weiss or Daniels or Chee or Barbera-Guillem.

7. Claims 4 and 21 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Dimitrov in view of Weiss.²
8. Claims 6 and 23 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Dimitrov/Dimitrov³ in view of Weiss/Weiss in view of Dimitrov or Vossmeyer/Daniels in view of Dimitrov or Vossmeyer, further in view of Chee/Barbera-Guillem.
9. Claim 7 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Weiss et al. in view of Dimitrov or Vossmeyer/Daniels in view of Dimitrov or Vossmeyer/Chee in view of Dimitrov or Vossmeyer/Barbera-Guillem in view of Dimitrov or Vossmeyer, further in view of Harris.
10. Claim 9 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Weiss in view of Dimitrov or Vossmeyer/Daniels in view of Dimitrov or Vossmeyer/Chee in view of Dimitrov or Vossmeyer/Barbera-Guillem in view of Dimitrov or Vossmeyer, further in view of West.
11. Claims 12, 13, and 15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Weiss in view of Dimitrov or Vossmeyer/Chee in view of Dimitrov or Vossmeyer/Barbera-Guillem in view of Dimitrov or Vossmeyer, further in view of Daniels.
12. Claim 13 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Weiss in view of Dimitrov or Vossmeyer/Daniels in view of Dimitrov or Vossmeyer/Chee in view of Dimitrov or Vossmeyer/Barbera-Guillem in view of Dimitrov or Vossmeyer, further in view of Rakvin.
13. Claim 24 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Dimitrov/Dimitrov in view of Weiss/Weiss in view of Dimitrov or

² It appears that Appellant inadvertently omitted this rejection from the list on page 3 of the Brief. Appellant does address this rejection on page 16 of the Brief. On page 16 of the Brief, Appellant states that claims 4 and 22 are rejected, whereas the Examiner states that claims 4 and 21 are rejected (Ans. 12). The Examiner indicates that a typographical error was made in the Final Rejection, and that claim 21 should be cited rather than claim 22.

³ This terminology reflects the Examiner's combination of the applied references in making a § 103 rejection.

Vossmeyer/Daniels in view of Dimitrov or Vossmeyer, further in view of Harris.

14. Claims 25-29 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Dimitrov in view of Weiss/Weiss in view of Dimitrov or Vossmeyer, further in view of Daniels.

15. Claim 28 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Dimitrov/Dimitrov in view of Weiss/Weiss/Daniels in view of Ravkin.

16. Claim 30 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Dimitrov/Dimitrov in view of Weiss/Weiss in view of Dimitrov or Vossmeyer/Daniels in view of Dimitrov or Vossmeyer, further in view of West.

17. Claim 30 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Dimitrov/Dimitrov in view of Weiss/Weiss in view of Dimitrov or Vossmeyer/Daniels in view of Dimitrov or Vossmeyer, further in view of Chee.

ISSUES

Has Appellant shown that the Examiner reversibly erred in finding that the references teach or suggest detecting photoluminescence properties of the nanoparticles altered as a result of physisorption of the chemical species onto the surface of the nanoparticles, as required by the claims?

FINDINGS OF FACT

Physisorption is a process in which the electronic structure of the atom or molecule is barely perturbed upon adsorption of the atom or molecule to a substrate. Wikipedia, the Free Encyclopedia,
<http://en.wikipedia.org/wiki/Physisorption> (last visited June 30, 2009).

In contrast, chemisorption is a process in which the electronic structure of bonding atoms or molecules is changed and covalent or ionic

bonds form between the atom or molecule and the substrate. Wikipedia, the Free Encyclopedia, <http://en.wikipedia.org/wiki/Chemisorption> (last visited June 30, 2009).

The Examiner has not identified teachings in the applied art of a chemical species being physisorbed onto the surface of the nanoparticles.

The Examiner has not identified teachings in the applied art of altered photoluminescence properties of the nanoparticles being detected as a result of the chemical species being physisorbed onto the surface of the nanoparticles.

PRINCIPLES OF LAW

“To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention, either explicitly or inherently.” *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997).

Similarly, when determining whether a claim is obvious, an examiner must make “a searching comparison of the claimed invention – *including all its limitations* – with the teaching of the prior art.” *In re Ochiai*, 71 F.3d 1565, 1572 (Fed. Cir. 1995) (emphasis added).

ANALYSIS

1. The Rejection of claims 1, 3, 5, 8, and 15 under 35 U.S.C. § 102(e) as being anticipated by Dimitrov.

Claim 1 recites “detecting altered photoluminescence properties of the nanoparticles comprising the adsorbate as a result of the chemical species being physisorbed onto the surface of the nanoparticles” in step c).

The Examiner recognizes that Dimitrov does not expressly disclose a chemical species that is physisorbed onto the surface of the nanoparticle.

Ans. 3. The Examiner states that “physisorption of a chemical species onto the surface of nanoparticles is a first necessary step before being chemically adsorbed onto the surface of the nanoparticles”. Ans. 3. The Examiner refers to the references of Hubby and Ouellet in support of his theory that physisorption must occur before chemisorption. Ans. 19.

Appellant argues that Dimitrov does not teach physisorption or detecting changes in photoluminescence of the nanoparticle as a result of physisorbing an analyte onto its surface. Br. 6.

The Examiner does not respond to Appellant’s arguments that Dimitrov does not describe detecting changes in the photoluminescence due to the physisorption of an analyte on the surface of the nanoparticles. Nor does the Examiner point to disclosure in Dimitrov indicating that physisorbed species are detected, as opposed to chemisorbed species. Whether chemical species physisorb before they chemisorb on the surface of the nanoparticles is not important since Dimitrov does not describe detecting the physisorbed species, as opposed to merely describing the detection of the chemisorbed species.

Appellants have thus shown, by the preponderance of the evidence, that Dimitrov does not describe every limitation of claim 1. Therefore, we reverse the anticipation rejection.

2. The Rejection of claims 1-5, 8, 10, 11, 14, 21, 22, 25, 26, and 30 under 35 U.S.C. § 103(a) as being unpatentable over Weiss in view of Dimitrov or Vossmeyer.

The critical issue is whether step c) of claim 1 is described or suggested by the combined teachings of the references. Step c) recites “detecting altered photoluminescence properties of the nanoparticles

comprising the adsorbate as a result of the chemical species being physisorbed onto the surface of the nanoparticles".

The Examiner has not adequately explained how Weiss detects altered photoluminescence properties of the nanoparticles as a result of the chemical species being physisorbed onto the surface of the nanoparticles. As Appellant points out, Weiss involves a nanocrystal linked to a linking agent linked to an affinity molecule, forming a nanocrystal probe. Br. 8. This nanocrystal probe bonds to a detectable substance in a material. The Examiner points to no teaching that altered photoluminecence properties of the nanoparticles are detected as a result of the chemical species (detectable substance of the biological material) being physisorbed onto the surface of the nanoparticles. If fact, Weiss describes two modes of using nanoparticles for detecting substances of interest:

With respect to the absorption of energy by the probe of the invention, when the excitation source is an electron beam, or an X-ray source, the presence of the organo luminescent semiconductor nanocrystal probe bonded to the detectable substance of interest in the material being analyzed can be ascertained using a commercially available energy absorption or scattering or diffraction detection system wherein *changes in absorption or scattering cross section or in diffraction of the material being analyzed can be detected*, signifying the presence of the probe in the material, which, in turn, indicates the presence of the detectable substance to which the probe is bonded in the material being analyzed. In addition, it may be possible to use electron or X-ray sources to detect the presence of the organo luminescent semiconductor nanocrystal probe bonded to the detectable substance by using a conventional detection system for the emission of visible light to observe the visible emission in the narrow wavelength of emission of the probe.

Weiss, col. 9, ll. 37-55 (emphasis added).

From the above excerpt, it appears that Weiss detects changes in absorption of the material being analyzed. It does not appear that Weiss teaches the detection of altered photoluminescence properties of the nanoparticles as a result of the chemical species (detectable substance of the biological material) being physisorbed onto the surface of the nanoparticles. Nor does the Examiner explain how or where Weiss provides such teachings. In the alternative embodiment, Weiss teaches that electron or X-ray sources can be used to detect the presence of the probe bonded to an analyte by analyzing emission of visible light from the probe. This alternative method also does not teach detection of altered photoluminescence properties of the nanoparticles comprising the adsorbate as a result of the chemical species being physisorbed onto the surface of the nanoparticles.

The Examiner does not rely on Dimitrov and Vossmeyer to cure the aforementioned deficiencies of Weiss.

In view of the above, we reverse the rejection of claims 1-5, 8, 10, 11, 14, 21, 22, 25, 26, and 30 under 35 U.S.C. § 103(a) as being unpatentable over Weiss in view of Dimitrov or Vossmeyer.

3. The Rejection of claims 1-5, 8, 12, 15, 21, 22, 27, 29, and 30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Daniels in view of Dimitrov or Vossmeyer.

A critical flaw in the Examiner's analysis is pointed out by Appellant on page 11 of the Brief. Therein, Appellant correctly indicates that contrary to the Examiner's finding that Daniels teaches non-covalent attachment of a detectable substance to a nanocrystal, paragraph [0088] of Daniels actually

pertains to the binding between members of the binding pair, and not the binding to the nanocrystal surface. Appellant also correctly points out that production of “nanocrystal conjugates” involving a member of the binding pair attached covalently to the nanocrystal by way of a linker species is described in paragraphs 178-187 of Daniels. *See* especially paragraph [0185].

As such, Daniels does not teach or suggest that altered photoluminescence properties of the nanoparticles are detected as a result of the chemical species (detectable substance of the biological material) being physisorbed onto the surface of the nanoparticles. The Examiner does not rely upon the secondary references to cure this deficiency.

In view of the above, we reverse the rejection of claims 1-5, 8, 12, 15, 21, 22, 27, 29, and 30 under 35 U.S.C. § 103(a) as being unpatentable over Daniels in view of Dimitrov or Vossmeyer.

4. The Rejection of claims 1-3, 5, 6, 8, 10, 11, and 14 under 35 U.S.C. § 103(a) as being unpatentable over Chee in view of Dimitrov or Vossmeyer.

On page 12 of the Brief, Appellant explains that Chee does not teach physisorption onto the surface of the nanocrystal. Chee teaches that beads are “coded” with nanocrystals or that the nanocrystals can be used as labels in assays. Chee, col. 4, ll. 45-51.

The Examiner does not point to any teaching in Chee which indicates that altered photoluminescence properties of the nanoparticles are detected as a result of the chemical species (detectable substance of the biological material) being physisorbed onto the surface of the nanoparticles. Ans. 7-9.

The Examiner does not explain how either of these systems meets the aforementioned claim requirement. Ans. 7-9.

Hence, we agree with Appellant's position. The Examiner does not rely upon the secondary references to cure the aforementioned deficiencies of Chee.

In view of the above, we reverse the rejection of claims 1-3, 5, 6, 8, 10, 11, and 14 under 35 U.S.C. § 103(a) as being unpatentable over Chee in view of Dimitrov or Vossmeyer.

5. The Rejection of claims 1-3, 5, 6, 8, 10, 11, 14 under 35 U.S.C. § 103(a) as being unpatentable over Barbera-Guillem in view of Dimitrov or Vossmeyer.

On page 14 of the Brief, Appellant explains that Barbera-Guillem does not teach that the nanocrystals interact whereby the analyte is physisorbed onto the surface of the nanoparticles. As illustrative, Examples 4 and 5 in columns 16-24 of Barbera-Guillem describe the use of the nanocrystals, including signal generation, but do not teach that altered photoluminescence properties of the nanoparticles is detected as a result of the chemical species being physisorbed onto the surface of the nanoparticles.

The Examiner does not point to any teaching in Barbera-Guillem which indicates that altered photoluminescence properties of the nanoparticles is detected as a result of the chemical species (detectable substance of the biological material) being physisorbed onto the surface of the nanoparticles. Ans. 9-10. The Examiner does not rely upon the

secondary references to cure the aforementioned deficiencies of Barbera-Guillem.

We therefore agree with Appellant's position.

In view of the above, we therefore reverse the rejection of claims 1-3, 5, 6, 8, 10, 11, and 14 under 35 U.S.C. § 103(a) as being unpatentable over Barbera-Guillem in view of Dimitrov or Vossmeyer.

6. The Other 35 U.S.C. § 103(a) Rejections

The remaining rejections (listed as numbers 6-17 on pages 4-5, *supra*) also rely on Dimitrov or Weiss or Daniels or Chee or Barbera-Guillem as evidence for teaching the detection of altered photoluminescence properties of nanoparticles comprising the adsorbate as a result of the chemical species being physisorbed onto the surface of the nanoparticles. Because the aforementioned deficiencies of these references are not cured by the other applied references of these remaining rejections (the Examiner does not rely upon these references to cure these deficiencies), we reverse these rejections also, for the reasons discussed, *supra*.

CONCLUSIONS OF LAW

Appellant has shown that the Examiner reversibly erred in finding that the references teach or suggest detecting photoluminescence properties of the nanoparticles altered as a result of physisorption of the chemical species onto the surface of the nanoparticles, as required by the claims.

Appeal 2009-001779
Application 10/633,335

DECISION

Each of the rejections is reversed.

REVERSED

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